The Mechanic.

SEPTEMBER, 1834.

[From the American Magazine.]

CHARACTER OF FRANKLIN.

Few men ever possessed such opportunities or talents for contributing to the welfare of mankind; fewer still have used them to better purpose: and it is pleasant to know, on his own authority, that such extensive services were rendered without any sacrifice of his own happiness. In his latter correspondence, he frequently alludes with com-

placency to a favorite sentiment, which he has also introduced into his 'Memoirs'—'That he would willingly live over again the same course of life, even though not allowed the privilege of an author, to correct in a second edition the faults of the first.'

His remarkable success in life, and in the discharge of his public functions, is not to be ascribed to genius, unless the term be extended to that perfection of common sense and intimate knowledge of mankind, which almost entitle his sagacity to the name of prescience, and made 'Franklin's forebodings' proverbially ominous among those who knew him. His pre-eminence appears to have resulted from the habitual cultivation of a mind originally shrewd and observant, and gifted with singular powers of energy and self-control. There was a business-like alacrity about him, with a discretion and integrity which conciliated the respect even of his warmest political foes; a manly straightforwardness before which no pretension could stand unrebuked; and a cool tenacity of temper and purpose which never forsook him under the most discouraging circumstances, and was, no doubt, exceedingly provoking to his opponents. Indeed, his sturdiness, however useful to his country in time of need, was perhaps carried rather to excess; his enemies called it obstinacy, and accused him of being morose and sullen. No better refutation of such a charge can be wished for than the testimony borne to his disposition by Priestly, (Monthly Magazine, 1782,) a man whom Franklin was justly proud to call his friend. In private life he was most estimable; two of his most favorite maxims were, never to exalt himself by lowering others, and in society to enjoy and contribute to all innocent amusements without reserve. His friendships were consequently lasting, and chosen at will from among the most amiable as well as the most distinguished of both sexes, wherever his residence happened to be fixed.

His chief claims to philosophical distinction are his experiments and discoveries in electricity; but he has left essays upon various other matters of interest and practical utility—an end of which he never lost sight. Among these are remarks on ship-building and light-houses; on the temperature of the sea at different latitudes and depths, and the phenomena of what is called the gulf-stream of the Atlantic; on the effect of oil poured upon rough water, and other subjects connected with practical navigation;

and on the proper construction of lamps, chimneys, and stoves. His suggestions on these subjects are very valuable. His other writings are numerous; they relate chiefly to politics, or the inculcation of the rules of prudence and morality. Many of them are light and even playful; they are all instructive, and written in an excellent and simple style; but they are not entirely free from trifling on serious subjects. The most valuable of them is probably his autobiography, which is, unfortunately, but a fragment.

As a speaker he was neither copious nor eloquent; there was even a hesitation and embarrassment in his delivery. Yet as he seldom rose without having something important to say, and always spoke to the purpose, he commanded the attention of his hearers, and generally succeeded in his object.

His religious principles, when disengaged from the scepticism of his youth, appear to have been sincere, and unusually free from sectarian animosity.

Upon the whole, his long and useful life forms an instructive example of the force which arises from the harmonious combination of strong faculties and feelings, when so controlled by sense and principle that no one is suffered to predominate to the disparagement of the rest.

HOLCOMB'S REFLECTING TELESCOPE.

The Committee on Science and the Arts, constituted by the Franklin Institute of the state of Pennsylvania for the promotion of the Mechanic Arts, to whom was referred for examination a Reflecting Telescope, manufactured by Mr. Amasa Holcomb, of Southwick, Hampden county, Massachusetts, have reported, that the following is the description of the instrument, as given by Mr. Holcomb.

The telescope submitted to the examination of the committee of the Franklin Institute is of the reflecting kind; has a focal length of six feet; the diameter of the speculum is three inches nine-tenths; the rays of light are reflected but once; the image formed in the focus of the speculum is viewed by a common astronomical eye-piece, or by a single lens; it has also an eye-piece for viewing land objects, which shows them erect. The telescope is of the same construction as those of Sir William Herschell,

the observer having his back towards the object, and looking directly towards the speculum. It has an advantage over those of the Gregorian and Newtonian forms, by showing the object brighter with the same aperture, there being no light lost by a second reflection. The diameter of the speculum is small in proportion to the length of the instrument; it will bear a diameter of eight inches, with much advantage, for viewing very small stars, in consequence of the great increase of the light.

The magnifying powers that are used are, forty, ninety, and two hundred and fifty.

Through the politeness of Prof. A. D. Bache, the committee were permitted to compare the performance of Mr. Holcomb's reflector with that of a five feet achromatic, of four inches aperture, by Dollond, the property of the University of Pennsylvania. The instrument was also compared with a three and a half feet achromatic by Dollond, and with a Gregorian of four inches aperture, the mirrors of which had been lately repolished in London. The short stay of Mr. Holcomb in Philadelphia, prevented the comparison of it with reflectors in the possession of other members of the committee.

On the evening of the 14th of April, the committee met by adjournment in the open lot south of the Pennsylvania Hospital, the use of which was politely permitted to the committee by the managers of that institution.

The following were the results of the comparisons:

The moon, nearly full, was too bright to be conveniently viewed with the lower powers of the instruments: with a power of 350 in the five feet achromatic, the moon appeared bright and well defined, with the same eye-piece, giving a power of 400, in the reflector by Mr. Holcomb, the moon was sufficiently bright, and equally well defined. The same, with the exception that the moon was more brilliant, and the field of view much greater, was remarked with the use of Mr. Holcomb's highest magnifier, giving a power of two hundred and fifty.

As an illustration of their comparative performances, it was remarked that the waved appearance of the outer declivities of the craters of some of the apparently extinct lunar volcanoes, indicating the successive depositions of the lava, was more manifest with a power of four hundred in the reflector.

The immersions of 3 and 4 Geminorum, of the sixth and seventh magnitude, were observed at the same instant of time in each.

The same occurred the evening before with a star of the eighth or ninth magnitude.

The immersions, however, of two very small stars, apparently of the ninth or tenth magnitude, were observed with difficulty in the refractor, but could not be observed at all in the reflector.

The companion of Polaris was best seen when the moon was up, in the refractor, but in the absence of the moon, it was readily seen in both.

Castor was easily divided with the lower powers of either, but in the case of this, as well as of other binary and double stars, the dark space between the stars was less disturbed by scattering rays in the reflector than in the refractor.

Bootes was seen double in each, but more distinctly in the reflector; Draconis, Leonis, and 4th and 5th, Lyra, were seen distinctly double in both instruments; Draconis, from the equality of the disks and softness of light, presented the finest appearance.

Virginis, with a power of three hundred and fifty in either telescope, gave no certain indications of being double. Some of the members of the committee were of opinion that it was slightly elongated.

It was stated by the artist that his reflector would divide stars distant 3″ from each other.

Estimating the distance of the stars observed by the late observations of South, and Herschel, jr., the committee were of opinion that his instrument is adequate to the distinct division of double stars distant from each each other 2″. 5.

The motion of this instrument, plainly mounted, was steady, and with the finder, even without rack-work, objects were easily made to range with the centre, or line of collimation of the instrument.

The position of the observers with the Herschelian telescope, was natural and easy, in contemplating objects having seventy or eighty degrees of altitude, though quite constrained and inconvenient in using the achromatic.

The reflector gave a distinct view of land objects, even when within one-fourth of a mile.

Some light was lost by the position of the head, an

inconvenience partially obviated by making the end nearest the object three inches greater in aperture.

The Gregorian, which probably was not a very fine instrument of its kind, bore no comparison in distinctness, or in quantity of light, with the Herschelian telescope.

From these trials, the committee are of opinion that Mr. Holcomb has been entirely successful in the difficult art of polishing specula wth the true curve, which gives to the objects viewed all the distinctness of figure that is given them by the best refractors manufactured by Dollond.

In one respect, (the largeness of the field of view,) the reflectors by Mr. Holcomb have a decided advantage over achromatics and reflectors of different construction, the apparent diameter of the field of view in the Herschelian being nearly double that of either, with equal freedom from aberration. The quantity of light furnished by the refractor was greater with the same aperture; an important advantage in searching for, and observing very minute objects. This deficiency of light in the Herschelian for viewing faint objects near the moon, or satellites near their primaries, the committee are of opinion may be removed, by enlarging the aperture of the Herschelian reflector to five or five and a half inches.

The simplicity of the method of preparing and mounting Mr. Holcomb's telescopes is worthy of notice, since on this plan, the artist is enabled to furnish for an expense of one hundred dollars, with plain mounting, or of one hundred and fifty to two hundred dollars, with more expensive mounting, telescopes whose performance equals that of Gregorians and achromatics hitherto imported into the country, at an expense of five hundred dollars.

By order of the Committee.

May 8th, 1834. WILLIAM HAMILTON, ACTUARY.

[For the Mechanic.]

PHILO'S STEAM-ENGINE.

THIS is not, in the first place, properly a steam-engine. It is a lead-weight engine. Neither does it at all fulfil the conditions which a rotary-engine ought to fulfil. First, it does not dispense with the fly-wheel, to equalize its motion. Indeed it cannot, as we shall soon see. It preserves the

principle of the crank-motion in the lead weight, which must act as a lever to pull round the wheel, and must, therefore, submit the wheel to all the irregularities of a crank-motion, with this further disadvantage, that while the steam is raising the descended weight, no power at all is exerted, and the machine is carried on by its momentum alone.

Such are the objections which we have to this, as a mere plan of a method of producing a rotary motion, directly through the agency of steam. In regard to its application to practice, we shall say but little. The inventor well knows that this is quite out of the question. The only means of obtaining a large power would be, in multiplying the size or number of steam-wheels, which for even a moderate power, would take up a most disproportionate space, and would require more tons of iron for fly-wheels than a common steam-boat could carry, unless it might be possible to make one weight descend while the steam was raising another, which might, perhaps, lessen the required fly-wheels one half in weight.

In short, we do not see why Philo should think of giving a plan, which, though it might do well enough in a model, would never be of any use, and which, above all, utterly fails of illustrating the principle of which it is intended to be an exemplification.

We highly applaud his ingenuity, and know that he has shown himself capable of exerting it for useful ends, but we hope the next rotary engine of his, will be at least a *steam-engine.* A.

[From the Journal of the Franklin Institute.]

PATENTS.

PATENT *for a Bee Hive;* Samuel Morrill, Dixfield, Oxford county, Maine, February 4.

Within a hive of the ordinary form and dimensions, there is to be a partition, or shelf, perforated with holes for the bees to pass through; over these holes are to be placed inverted glass tumblers, within which they are to form their combs. What the patentee claims as his invention is, 'the use of glass tumblers in which to receive the honey, and

the manner of preparing the partition plate.' If the inventor of this *novel* mode of collecting honey, were the possessor of all that article, and its accompanying wax, which has been obtained in similar glass vessels, he would have no occasion whatever to regret the entire worthlessness of his patent, as he might undoubtedly freight several large vessels with the contents of his store-house, and live comfortably on the returns for the remainder of his days.

PATENT *for Tanning Hides and Skins;* George Burr, Watertown, Jefferson county, New York, February 6.

The hides, or skins, are to be submitted to the action of beating, or pounding, in, or by means of, any kind of apparatus which will answer that purpose, they being at the same time immersed in the ooze, or tanning liquor. The best means of effecting this, is said to be the employment of the common fulling-mill; the hides being put into the trough and acted upon as is usually done with cloth; the ooze, or tanning liquor being put in with them, and renewed as it becomes exhausted. By this action, the hides, or skins, will, it is said, rapidly, absorb the liquid, and become perfectly tanned in a few hours.

PATENT *for a Machine for Dressing Feathers;* George Reynolds, East Hartford, Hartford county, Connecticut, February 7.

This machine has, exteriorly, very much the appearance of a large cylindrical coffee-roaster. A cylinder of sheet iron, which may be three feet long, and eighteen inches in diameter, has a shaft through its centre, which revolves freely within it, and from which project a number of pins that may be formed of wire, and of such length as nearly to touch the cylinder. The shaft is of wood, but iron gudgeons from its ends pass through the heads of the cylinder, and one of them receives a crank by which it is turned, the shaft lying horizontally. A door, extending the whole length of the cylinder, opens on one side of it, to admit and discharge the feathers. This machine is to be placed where a fire, the heat of which can be properly regulated, may be placed under it. The feathers to be dressed are first washed quite clean, and suffered to become half dry; they are then placed in the machine, and exposed

to the action of a moderate heat, whilst the machine is made to revolve; in this situation they are to be allowed to become perfectly dry, which will be known by the ceasing of the issue of steam through small openings left in the heads for that purpose. It is said, that however dead and matted the feathers may have been, they will, by this process, be rendered quite lively; and, whether old or new, they will be equally light, and deprived of every bad smell.

PATENT *for Locks and Bolts without Springs;* Henry C. Howells, Putnam, Muskingum county, Ohio, February 10.

Although this patent is taken for a very important article, the door lock, the specification of the invention does not contain more than fourscore words. We are merely informed in it, that the bolt is to be projected by a lever, or weight, by means of joints and cogs, or without either; that there is a movable weight inside of the lock, which operates instead of a spring, and that in other respects it is like other locks. Thus ends the specification, without any claim. The drawing, however, has ample references to the various parts of the lock, making its construction completely known; and we are sorry to say that there is not anything in it which we are able to praise, although we believe it to be, in many respects, new. The object of a lock is security, and when patents are obtained for improvements in them, it is usually proposed to attain this end in a more perfect manner than had been previously done; we, however, have rarely seen a lock which we would more willingly undertake to pick than that before us. It is without springs, it is true, but *quo bono?* is a proper question upon such an occasion, and one which we could not answer satisfactorily.

The bolt is to be turned by a handle, like that to the spring bolt of an ordinary lock, but there is to be a small wheel with cogs upon the shank, which take into corresponding cogs upon the bolt. Another bolt is to be acted upon by the key, and this, when shot forward, fixes the first bolt in its place, so that it cannot be turned by the handle. Instead of the spring tumbler that falls into the notches on the upper part of the bolt, there is a weighted, sliding tumbler, which, most certainly, is no improvement; as, among other objections, it will very soon, from the thickening of the oil, and the insinuation of dust, refuse to fall by its own gravity.

PATENT *for an improvement in the Printing Press;* Daniel Neall, Philadelphia. First patented November 15, 1825. Patent surrendered and re-issued under an amended specification, February 13.

We shall not give any description of this press, as it is to be found, with a plate, in the American edition of Nicholson's Operative Mechanic. In the original specification there was not any claim made, and the omission is now supplied in the following form :

'The peculiar advantage of this press is, that the power by which the inking process, and the removal of the printed sheet, are effected, is obtained from the necessary movement of the bed ; and of this improvement, whether effected precisely in the manner specified, or in any other operating upon the same principle, and producing a similar effect, I claim to be the inventor.'

[For the Mechanic.]

CALCULATING THE TEETH IN GEARED WHEELS.

IN clock and watch work, and other machinery, where the degree of speed is fixed for each particular part of the machine, the velocities must be varied by varying the number of teeth, and consequently the size, of the wheels which constitute the train of work. As the teeth in each pair of communicating wheels must be equal, their number will be in direct proportion to the diameter or circumferences of the wheels. A wheel geared with another, if double the diameter, will revolve twice while that revolves once ; for the teeth on the circumference of the large wheel being twice as many as on the lesser one, the lesser one must revolve twice, in order that its teeth shall have taken hold of all the teeth on the large one. The diameter, then, and the number of teeth, are proportional, and may be substituted for each other in calculation, (provided we use either one or the other throughout the calculation,) and the one will be a measure of the other.

The velocity communicated, then, will be *inversely* as the number of teeth in the wheel or wheels, *to* or *through* which the motion is propagated from the one assumed as

the mover. A wheel of 120 teeth will carry one with 240 teeth with half the velocity, and one of 60 teeth with double the velocity of itself; the former making half a revolution, and the latter two revolutions, to every one revolution of the mover.

A single wheel communicating motion from one wheel to another does not vary the speed of the train. For, suppose two wheels of 18 and 36 teeth, connected by a small wheel of 9 teeth. The wheel 36, will, if connected immediately with the wheel 18, be caused to revolve with a velocity one half of that of the wheel 18. Now, the wheel 9, connected with the wheel 18, will revolve twice as fast as the wheel 18. But the wheel 36, connected with the wheel 9, will be driven by that, with only one fourth of its velocity, which is, in fact, half the velocity of the wheel 18, the same result as in the former supposition. Hence as wheels geared together turn contrary ways, we may, by interposing a third wheel, cause the two to revolve the *same* way, when desired, without destroying their relative velocity.

When it is required to make two wheels which shall communicate any degree of speed, it is, then, only necessary to proportion in like manner the number of teeth, or their diameters. Two wheels with 27 and 18 teeth will make severally 2 and 3 revolutions in equal times. Where the required ratio is very large, the size of the wheels will be rendered so extremely disproportionate, that the variation of velocity must be distributed through several pairs of large and small wheels, the smaller of which are called pinions. One large wheel drives a small wheel or pinion, on whose axis is a large wheel also, which drives another pinion on another axis, &c.

Suppose it be required that a wheel of 50 teeth shall drive another with 100 times its velocity. To accomplish this, without the intervention of other wheels, the lesser wheel must be one hundred times smaller than this. But the wheel of 50 may communicate to a wheel of 10 teeth, five times its velocity; on the axis of this, place another wheel of 50 teeth, to communicate with another of 10 teeth, and on the axis of that, a wheel of 32 teeth to drive a wheel of 8 teeth. The velocity gained at the termination of the three pairs will be $5 \times 5 \times 4 = 100$, as was required.

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It will be seen that the velocity gained by each single pair is some even divisor of the whole velocity, and this should necessarily be so, that the *product* of the separate velocities shall equal the whole velocity. The actual number of teeth is not important; for instance, instead of 50 and 10 as above, we might have substituted 40 and 8, &c., only provided that the one be five times the other, &c.

But suppose the velocity to be gained be expressed by a prime number, which has, of course, no divisors. Let for instance, 37 be the number, and we will undertake to gain the velocity of 37, by a train of two pairs of wheels. Let 6 be assumed as the velocity to be gained by the first pair, or in other words, the proportion to be given to their diameters or number of teeth. Dividing 37 by 6, we have a quotient $6\frac{1}{6}$, for the velocity to be gained by the second pair. This velocity is expressed by the very ratio $\frac{37}{6}$, whose division produced it. A wheel of 6 teeth, then, would give a wheel of 37 teeth the required velocity. But 6 is too small a number, and such a wheel cannot well be made; doubling *both* trains, therefore, we have 12 and 74, as the numbers for the second pair. 12 and 72, having a ratio of 6, will be convenient numbers for the first pair.

Suppose it were required to divide between two pairs, a number having a fraction, as $13\frac{1}{2}$. Assuming some convenient number, as before, which will take about half the velocity, as 4, for the ratio of the first pair, we take the ratio 4 to $13\frac{1}{2}$, for the ratio of the second pair. Without regard to the size of the wheels, we must now multiply the ratio by the denominator of the fraction, (which is here 2,) to get rid of the fraction. We shall, then, in the present case, have the ratio 8 to 27, in whole numbers, and if the number 8 give too small a pinion for our work, we may double again, and we shall have 16 to 54 as the numbers of the second pair. The velocity of 1 to 4, for the first pair, may be conveniently gained by the numbers 12 and 48.

Suppose now, that we are limited to a particular distance of shafts or axles for any pair of wheels. This distance will be equal to the sum of the semi-diameters of both wheels, prescribing a proportionate number of teeth to the wheels. Suppose that the distance be such as to allow in both wheels the sum of 120 teeth, of the size most proper to employ. This distance may be, perhaps, 3 or 4 inches, but that depends on the size of the teeth we choose to

make. The ratios of velocities we can produce within these assumed limits, are those, *the sum of whose terms is an even divisor of* 120, or whatever number to which the sum of the teeth in both wheels is limited. Thus, we may have a pair of the relative velocities of 1 to 4, 2 to 3, or 1 to 3, because 5 and 4, the sums respectively of the terms 1 and 4, 2 and 3, and 1 and 3, are even divisors of 120. Suppose we require, within these limits, to gain a velocity of 3 times, or 1 to 3; the sum of the terms 1 and 3 being 4, which is a divisor of 120, we can, as above shown, accomplish this. Dividing 120 by 4, we have a quotient 30. Multiplying this by the term 1, of the ratio, it gives 30, for the teeth of one of the wheels, and by 3, the other term, it gives 90, for the teeth of the other wheel. One of these is evidently, as required, 3 times as large, and their sum is, as required, 120. When the number is a prime, ratios may still be constructed, but the sums of whose terms must be equal to the number itself, and which will be themselves the number of teeth in the wheels. By making teeth of such a size that their number will be any required proportion to the inches of diameter or circumference, any required ratios may be obtained. If we have become obliged, by the size of our wheels, to limit the teeth of one size to the number 136, which may make it impossible to construct wheels of the required limits, say a velocity of five times, we may, by making the teeth larger, reduce the number to 120, or by diminishing them, increase it to 148, either of which will give the required ratio.

In this case, as in every other mechanical contrivance, an increase of velocity is accompanied with a proportional decrease of power, and vice versa. A train of wheels for conveying any variation of velocity may, in like manner, be compared to the compound lever, or blocks of pullies, the only difference being, that in the present case, the loss or increase of power is merely consequential, the variation of speed being the primary object, whereas, in those cases, an increase of power is the thing directly aimed at.

EUCLID MINOR.

[For the Mechanic.]

PRESSURE OF THE ATMOSPHERE.

Fig. 1. Fig. 2.

When the pressure of the atmosphere is well understood, an important lesson will be learned in natural philosophy. By this pressure, the water rises in the pump and flows from the syphon. By the same cause, the mercury is sustained in the barometer, for the higher you ascend from the earth the lower the mercury falls in the tube; in fact, the barometer thus becomes a measure for the height of a mountain or the elevation of a balloon.

Take, for an example, the experiment represented at fig. 1. A small air-pump is placed, air-tight, upon a tall glass receiver; a tube passes down from the pump into a cup of mercury at the bottom. On working the small pump, the mercury will rise in the tube to the height of about 30 inches; but if the receiver be placed on the ground plate of a large air-pump, and exhausted of air, then the mercury will not rise in the tube on working the small pump, showing the necessity of the pressure of the atmosphere upon the mercury in the cup, in order for it to rise in the tube.

Fig. 2 represents an apparatus for showing the upward pressure of the atmosphere, in a very striking manner. To a bowl, with a bladder tied loose over its mouth, a weight is suspended. On exhausting the air from the bowl by

the small pump, the external pressure of the air, in endeavoring to get into the bowl, presses the bladder up, and with it raises the weight. A quart bowl will do to raise a weight of 50 pounds and upwards. PHILO.

[From the Evening Gazette.]

OPENING OF THE RAIL-ROAD TO HOPKINTON.

THE Stockholders of the Boston and Worcester Rail-Road met, by invitation, on the 20th inst, at the opening of the road to Hopkinton.

They started from Boston at 2 o'clock, and on their arrival at Framingham were welcomed by Governor Davis, ex-Governor Lincoln, and other gentlemen of distinction, who then took a seat in the cars and proceeded to Hopkinton, where they arrived at 25 minutes past 3 o'clock, under a salute of artillery, and the presentation of arms by an excellent military company. Col. Shepard, in behalf of the inhabitants of Hopkinton, and of the citizens generally of the heart of the Commonwealth, expressed the high gratification felt by the country people at this bold and successful enterprize, and gave his and their decided opinion of the highly beneficial results, both for the country and the city, which would flow from it, and gave the stockholders a hearty welcome, and invited them to partake of a collation. Nathan Hale, President of the rail-road, responded in a neat, appropriate and heartfelt address, fully concurring in the sentiments expressed by Col. Shepard, which cheered onward and onward and still onwards the enterprise, until we reach the farthest west.

The Temperance House of Col. Stone was then entered, amidst the cheerful smiles of a most beautiful collection of ladies and the loud cheers of thousands, and the cheer within corresponded to the general mirth and feeling.

After the collation, our warm hearted and public spirited fellow-citizen, Henry Williams, of Boston, made a few remarks, inviting the attention of all to Gov. Davis's views. The Governor then made his appearance on the piazza of the hotel, and presented to his fellow-citizens a most enlightened view of the importance of cheering on Internal Improvements, which would make this great empire like a

band of brothers, and enable us to present to an invading enemy, a great force, concentrated on any emergency, with the celerity of thought. His remarks were listened to with the profound attention due by an enlightened audience to such enlightened views, and with that enthusiastic ardor which, on all occasions, cheers onward this great nation to feats of great usefulness.

Gov. Lincoln was then loudly called for, and, in his turn, presented an enlightened view of the great importance of internal improvements, and of the usefulness, particularly to the country, of this great Boston enterprise. He spoke like a man who breathed aloud for the public good, and his words were received by a heartfelt response from an admiring audience.

During the dinner, the fairer portion of the audience had eloped; and presently we saw the long train of Rail-Road cars returning, surmounted by the elegant military company, and richly laden with some of the finest products of the country.

The ladies then alighted from the cars, and the Stockholders took their seats homeward, casting a lingering look towards their hospitable hosts, amidst the loudest cheers, and waving of handkerchiefs and the finest feelings.

In one hour and twenty minutes they arrived in Boston, (half-past 6 o'clock,) highly gratified, and presaging the most successful results.

[For the Mechanic.]

COLD AIR BLAST IN FURNACES.

It is said, that a better fire is produced by a cold blast than a warm one. On this account, it is stated, that the manufacture of iron at the furnaces is more successful in winter. The impression at first would be, most naturally, that this was erroneous, and that the cold air would be injurious, by cooling the fire. The case, however, is this. Warm air is much lighter and thinner than cold air. The desideratum in producing a great fire is, to consume as much oxygen as possible in a given time. For every measure of oxygen consumed releases a certain portion of caloric or heat; the more oxygen, therefore, can be disposed

of in any time, so much the more heat will be produced. Now, as the natural draught of the atmosphere does not supply oxygen with sufficient rapidity to produce the requisite heat, a bellows is employed to force the air into the fire in a great quantity. In furnaces, this is worked by water or steam-power. The effect of this operation will be proportionate to the quantity of air the bellows will contain. Of course, a large bellows is more powerful than a small one. But of equal bulks of cold and warm air, the cold air is much heavier and more dense. The bellows will, therefore, hold much more air in its cold, and consequently, condensed state, than it would when already heated. The cold air, then, which the bellows throws into the furnace, will expand to a much greater bulk, in the heat of the furnace, than the warm air, and this will more than compensate for the additional quantity of heat required to raise its temperature. EUCLID MINOR.

SNOW-SHOES AND MOCCASINS.

It may appear absurd to describe a snow-shoe to some readers, but as I have felt pleasure in learning what a palanquin is, those whom duty may have called into temperate or tropical zones may be glad to know what vehicle can support the weight of a man on the light and frail surface of his own height of snow, so as to enable him to walk with ease and comfort over it, and where, without such assistance, he would infallibly perish. The snow-shoe is made somewhat like a racket; the frames of my own were just 3 feet in length by 15 inches in width, of hickory, (which is tougher and more elastic than ash) with two cross-bars to connect and render them firm; the network to support the feet is of dressed Cariboo deer, or buffalo hide, strongly interlaced and drawn very tight; that which is perfectly dressed never slackens by moisture, but continues quite elastic, which is of great importance, for if the net of the shoe becomes slackened, the fatigue of the wearer is greatly increased from the want of elasticity in his shoe. At nine inches from the front of it is an aperture, behind the cross-bar, to allow the toes to play in, with a leather strap over it to secure the toes from slipping,

and the foot is firmly secured to this spot by a long bandage of list or cloth, crossed over the toes and behind the foot round the heel, that it may not slip. My shoes cost 16s. the pair, and weighed one pound and a half when dry; they were full half a pound heavier, if wet, when the strain caused by lifting them, to those who are unaccustomed to snow-shoes, causes an intolerable pain in the tendon of Achilles, which the Canadians call '*le mal de raquette;*' in this case the sufferer must halt for awhile, to ease his agony, in order to collect fresh resolution to bear it anew, for custom alone enables the muscles to support the exertion, especially if the snow is damp.

The *moccasin*, or slipper, to be worn with the snow-shoe, is also an article of consequence, for if it be not well prepared, it is speedily saturated in wet snow, which, in a long and cold winter's march, is absolute misery. It should fit comfortably over three or even four pair of woollen socks, to keep the foot both warm and soft. It should be made of moose, deer, or ox hide, well tanned, then soaked in strong brine for twenty-four hours, in order to soften the leather and keep it moist; when drained and half dry, steeped in train oil for several days until completely saturated, and afterwards gradually dried at a distance from the fire. Thus prepared, they will last a great while without being penetrated by snow or water. Even shooting shoes or boots, dressed in this way, are softer and more useful to sportsmen than all the anti-attrition compositions I have ever used.'

[For the Mechanic.]

FRICTION.

Great as is the loss of power from friction, it is to be feared that in its absence, still greater evils would take place than were ever produced by it. The first idea suggested by the taking away of friction would be, the leaving things in such a state that they would slide over each other on the least force possible being applied to them. Such a state of things, though it would be very convenient for the machinist, and a few others, who wish to gain the greatest power at the least expense, still, to the greater part of the

world, it would be far from desirable. Nothing that we should lay down would rest in its place, without being moved off by every current of air.

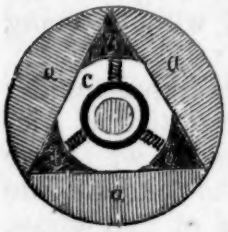
But however well the theorist may console himself under all the evils of such a state of things, we fear that if friction really were removed, by the only means by which we can presume its removal possible, the state of things would be not only worse, but quite the reverse of that above described. As friction depends upon the resistance of the minute irregularities and protuberances on the surfaces of bodies, the only way to remove friction would be to remove these irregularities, and make all things perfectly smooth. Now, it can be proved, even by imperfect experiment, that were bodies *perfectly* smooth, so that all the particles in the surfaces could come in contact, the attraction between these particles holds them firmly together. The air, which lodges in the cavities on the surfaces of bodies not perfectly smooth, prevents the external pressure of the air from holding them together, and the unevenness of the surfaces also prevents only a few of the particles from coming near enough for attraction to hold them together. Thus, although bodies move and slide upon each other better, for being perfectly smooth, and for having the cavities filled with oil or some other substance, (because in that case there is no resistance offered,) still the resistance becomes so much greater in pulling them apart.

The effect of this desideratum, never to be attained, would therefore be, to stick everything together. The only remedy for this, would be, to get rid of the atmosphere, in order to take off the pressure of that fluid; but this would be only a partial remedy, for it would be necessary to get rid of attraction also, and then nothing would hold together.

HEATON'S IMPROVED METALLIC PISTON.

In Barton's piston, the three springs which force out the wedges reach against the piston-rod, and are quite independent of each other. In this piston, as constructed by the Messrs. Heaton, a more perfect arrangement exists, which will be made intelligible by the following sketch:

aaa, are the three metal segments; ***bbb,*** are the protruding wedges acted upon by three spiral springs, which react separately and simultaneously against a steel ring, *c,* which surrounds the piston-rod at some little distance. The advantage of this arrangement consists in the uniform distribution of pressure throughout the apparatus.



In the event of one spring being much stronger than another, in Barton's mode of construction, one wedge is pushed forward with more force than the others, and unequal wearing is the consequence; in Heaton's piston, on the contrary, any excess of strength in one spring is met by the yielding of the others,—the most perfect self-adjustment taking place.

The ring *c* is itself a spring to a certain extent, aiding and assisting the action of the others; and although it may not always be found in the centre of the piston, yet will it invariably be found in the true *centre of the combined forces,* producing the most perfect equilibrium in all the parts, and thus affording a steam-tight piston, with a minimum quantity of pressure, and, consequently, of friction also.—Mec. Mag.

EVERY ONE TO HIS TRADE.

What shall a man do who has no trade? Learn one. Every one need not be a mechanic; but let every body have some honest employment, understand his business, 'stick to his trade,' and let other people's affairs alone. This is the way to grow rich, and live happy.

When I go into a barber's shop, and hear Mr. T——, whose information extends but little beyond the end of his sign-pole, prate politics, puff the French Directory, and legislate for the American Congress, I say to myself, 'every one to his trade.'

A wig and a constitution are very different things; a man may be quite a connoisseur in one, and very ignorant of the other; T——'s tongue proves this as fully as a 'strong argument chain.'

The industrious farmer or mechanic, who is not content with small and sure gain, should remember, 'a bird in the hand is worth two in the bush.' After they have tried their dear experiments in merchandise, horse jockeying, or land speculation, they will have reason to lament their not adhering to my text. 'Any trade is good, if well followed.' A man may make more at journeywork in a poor trade, that he is master of, than by an apprenticeship in better business, that he is unacquainted with.

The lawyer harangues for his clients, reads authorities, quotes precedents, refines, defines and splits hairs; says much that you do n't understand, much that you are unable to contradict, and more that you do n't believe: you hear him through, from 'may it please your honors,' to 'I submit it to you, gentlemen of the jury;' you approve of part —of the rest you only say, he is a lawyer, 'Every one to his trade.'

But, say ignorance, prejudice and rogues, this is an unnecessary trade, a dishonest trade. Hold, friends; 'all trades must live.' While there are rogues, ignorance and prejudice, there must be laws, and while there are laws, there must be lawyers, or every body must leave their trade to study law.

When two persons are at variance, they think very different of the merits of their cause; they tell different stories to their lawyers—both sides are sure of the cause—a lawyer is not a conjurer; he can 't foretell what the witnesses will say; when they come before the court, out comes the truth against the unfortunate client: he loses his case; and makes amends by cursing the profession.

Deal fairly with your neighbors, tell the plain truth to your attorney, and you will have but little occasion to speak ill of the lawyer's trade.

MISCELLANY.

American Magazine.—We are pleased to see that the American People are to be furnished with publications more suited to the character and spirit of a free country and of free institutions, than the productions of the English Press. Valuable as the popular works on science and useful knowledge are, which come to us from that source, it is necessary that the people of this country should be furnished with something which shall enlighten them, in respect to the connection of science and the arts with their own country. Though united by language as well as by descent, in a kind of fellowship with that country, still our circumstances are in a high degree peculiar. We have our manufactures, our agriculture, our learned men, and they have relations with us and with our welfare, in which English works are not concerned, and in which they take no interest. It is necessary that a people should have a national literature of their own, and a national science, and that these should have their own proper Magazines—expositors of their claims, and representatives of their existence to the public.

The number which has been already issued of this work has, evidently, a high claim on the patronage of the people, as a fair specimen of what an American Journal of useful knowledge should be. It will be, undoubtedly, a valuable 'Family Magazine,' and will secure itself a place among the standard periodicals of the day, being, as it is, in the hands of those who are able to give it respectability in all its departments.

The Tobogin, or Indian Sledge.—An article of importance in a winter march through the forests of America, is the Tobogin, or Indian sledge, for conveying baggage or provisions. It is made of a hickory or ash plank, scarcely a quarter of an inch thick, about six feet in length and a foot in breadth, so as to fit the track of a snow-shoe. The head of a tobogin is turned up like the fingers of a hand half-shut, in order to throw off the snow. Attached to it on each side are two light sticks, secured by thongs, which form the sides of the vehicle, which, when it is packed, prevent anything from falling off it. We added a pole behind, in order to assist the man who dragged it in front, by another pushing it on or keeping it back when going down hill. Each tobogin was supplied with a large tarpaulin, cut so as to pack in the most snug manner, the men's knapsacks being laid on the bottom of

them, and the arms stowed on the sides. A man can draw this carriage with a hundred weight on it, easier than he can carry his knapsack.

Flying.—Of all the attempts of human philosophy, that of flying is the most unphilosophical. No creature on earth whose weight is as great as that of man, can fly. Strength does not increase equally with size, and this is true of both muscular strength and strength of inert matter. Take two pieces of granite, one weighing one hundred tons and the other half an ounce. Drop them from a high elevation on a rock. The one will be shattered to atoms, and the other will hardly be bruised by the fall. Muscular force is much greater in small animals than large ones, in proportion to their size. A large beam will not bear twice as much weight as one of half the size. So, if it requires a force of one pound to support a small bird in the air, exerted through the medium of wings, a degree of force as much greater as a man is greater than the bird, could by no means lift the man up. But the man can exert no more strength in proportion to his size than the bird can, nor so much; therefore the man cannot fly. These are the results of experiment, and all experiment united with theory, confirms the fact that man was not made to fly.

The Pyramid.—The most substantial form of building, is that which exhibits the broadest base in proportion to the solidity of the structure. The pyramid, though a very inconvenient form of building where usefulness is required, is the maximum of durability. Those of Egypt are the oldest entire structures in existence on the globe. Some of these are of immense size, covering many acres of ground. The name *pyramid* had its origin from a Greek word signifying fire, from its supposed resemblance in form to a flame of fire, tapering upwards.

The Arch.—This beautiful contrivance is supposed to have been unknown in old times. No traces of this form of building occur in the Egyptian and the *older* Greek ruins. It is much to be wondered it was not sooner known. The first approximation to the arch seems to have been made by laying the pieces of material overhanging each other on each side till the courses met at top. Perhaps the falling in of these, and their catching together before they fell quite down, first suggested to the workman that if the pieces were at first put in wedge-form, their weight would itself hold them together. The beauty of stone bridges depends upon the arches on which they are supported.

STEAM.—What will come next? Rapid, indeed, has been the march, not of mind, but of steam these past years. The last accounts we have seen are of an *aerial* steamboat. When the vast fields of air have become navigable we may expect a new era of the arts. Perhaps steam sailing on the waters is supposed to be so near its *ne plus ultra*, as not to afford much farther scope for display of talent and ingenuity, and steam-travelling by land being monopolized by rail-road companies, the ingenious idea has occurred to some one of occupying the untenanted fields of air. Whether the power of steam can be applied efficaciously to navigate vehicles through the air, supported by balloons, is to us very doubtful. Allowing that a mere experiment may succeed, there is little room for supposing that it can ever be made generally advantageous, or practicable for any extensive operations. The necessity of carrying fuel and water will form a speedy limit to the extent of aerial steam-navigation. The weight of an engine sufficiently powerful to afford the requisite propelling force must be another source of difficulty, as it must be a perfectly *dead* weight, taking just so much from the power of the balloon of supporting whatever is to be carried or transported in the vehicle. The balloon itself too, is rather than else a costly machine of support, and therefore so much greater is the loss occasioned by incumbering it with great weight. A steam-machine for elevating itself in the air by its own power, is a complete chimera, for a stronger reason. The fact is, man never was made to dwell in the upper regions, and therefore it is, that nothing appears to render his exploits in that quarter useful.

NORCROSS'S DIVING APPARATUS.—It appears to be of a simple construction. A large cap made of lead, with a circular glass in front, and weighing about 74 lbs., envelopes the head, and rests upon the shoulders: to this the water-tight India Rubber dress is affixed. The air is conveyed into the cap by means of tubes, made of India Rubber cloth, through which it is propelled by a forcing pump, kept in the boat or vessel, as the case may be. Shoes made of lead, weighing several pounds each, are also worn. At the depth of 24 feet, no inconvenience is experienced from supporting this weight, which should be graduated according to the depth of the water.